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# **An Interim Assessment of the Shoal Lake Fishery 1986**

## **Report 1987-01**



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## An Interim Assessment of the

### Shoal Lake Fishery - 1986

by

S. Lockhart



Lake of the Woods - Rainy River  
Fisheries Assessment Unit Report

1987 - 01



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## ABSTRACT

Monitoring of the Shoal Lake fishery was continued in 1986. The estimated size of the walleye spawning population at Waugh dropped to 9,357 from an estimate of 30,886 in 1985. The dominant 1979 year class accounted for 72.6% of the walleye tagged while the 1983 year class comprised 12% and may be important in the success of future spawning runs. Weather conditions were not optimal for spawning in 1986. Brown bullhead and yellow perch continued to feed on deposited walleye eggs.

The 1979 walleye year class contributed 48.7% to the overall walleye catch in index nets. The 1983 year class appeared moderately strong at 37.2% of the walleye catch. The 1981, 1982 and 1984 year classes were poorly represented in index nets. No YOY walleye were caught through index netting, seining or electrofishing during 1986.

Commercial fishing and angling for species other than walleye was minimal.

Walleye stocks on Shoal Lake do not appear to be recovering. Assistance in the form of fingerling transplants may be required in the near future.

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## TRAP NETTING

Two 1.2 m trap nets were fished at the Waugh spawning site at the mouth of the Falcon River from April 23 to May 9, 1986 (Fig. 1). A total of 203 walleye (Stizostedion vitreum) were tagged and the right pelvic fin clipped. Two walleye carrying tags from the 1985 spawning run and one from the 1984 run were caught and released. Thirteen walleye were sampled for electrophoretic studies. The 1986 walleye spawning population was estimated at 9,357, ranging from 2,729 to 15,719 at 95% confidence limits (Schnabel 1938). This estimate was lower than the 1985 estimate of 30,886 (Lockhart et al 1986). For comparison, Bailey's Triple Catch method for a large sample gave a population estimate of 20,686 for the 1985 spawning run, ranging from 4,481 to 36,891 at 95% confidence limits (Bailey 1951). The low number of tagged walleye being recaptured results in wide confidence limits and these population estimates should be viewed with caution.

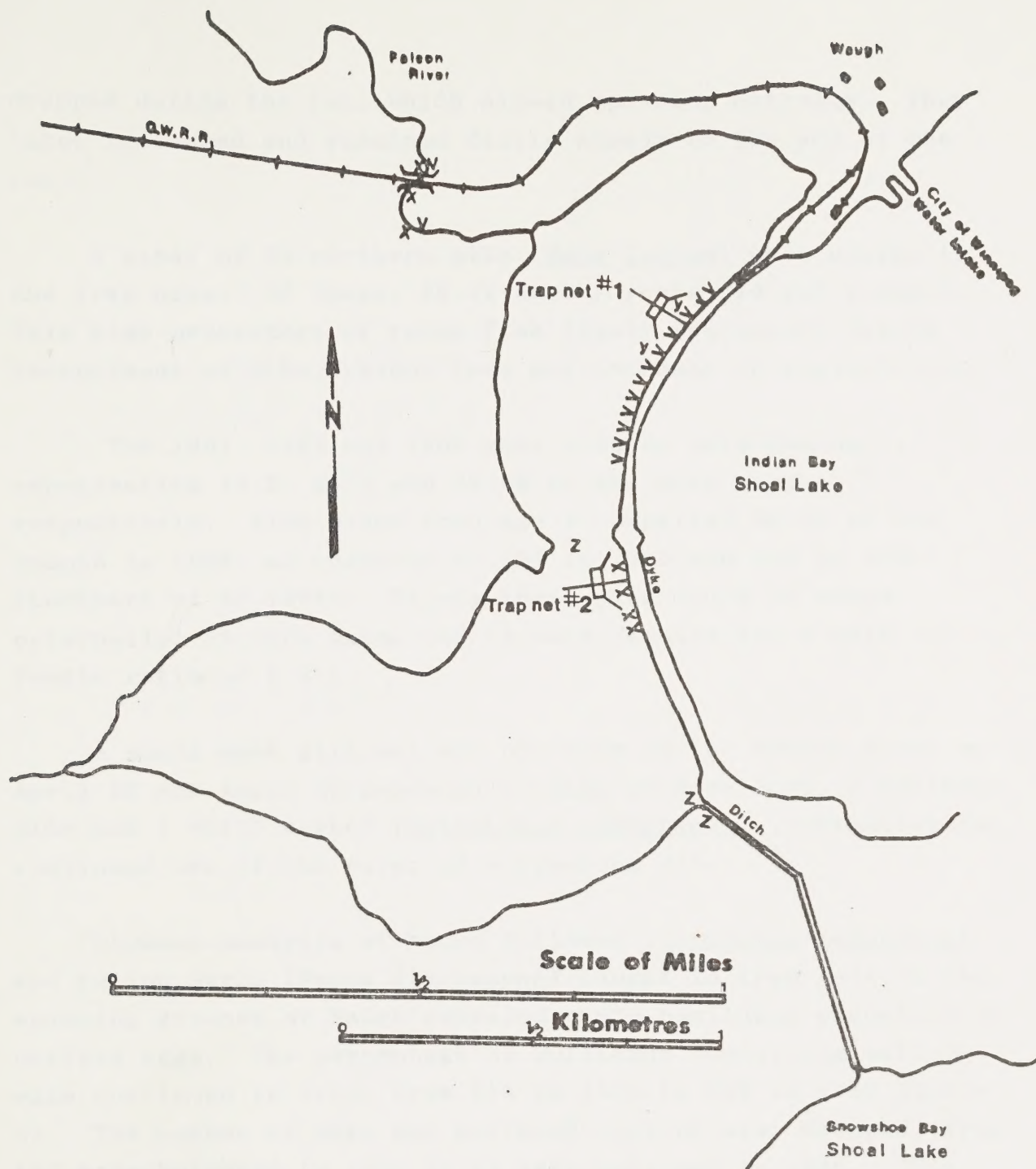
The ratio of male to female walleye in 1986 was 0.49:1 (71 males to 145 females), compared to 1.2:1 in 1985 (251 males to 213 females). This decrease in the male to female ratio was due to the increased recruitment of mature females of the strong 1979 year class into the spawning population.

Seven year old fish comprised 72.6% of all spawners (Fig. 2). Five percent of all sampled walleyes were older than age 7 and 22.4% were younger than 7 years. The 1983 year class appeared moderately strong, contributing 11.9% in the sample. All of these were males. The 1987 spawning run should see the arrival of increased numbers of this 1983 year class as the female walleye begin to mature and the males approach 100% maturity.

Weather conditions experienced during the 1986 spawning period were not as favourable as in 1985. Water temperatures







- x - walleye spawning sites improved in 1984 and 1985
- v - walleye spawning sites improved in 1983
- y - locations of egg baskets, April - May 1986
- z - locations of fry traps, April - May 1986

Fig. 1. Map of Waugh spawning site, Shoal Lake, showing location of trap nets, egg baskets, fry traps and walleye spawning bed improvement sites.



dropped during the run, which slowed spawning activity. They later increased and remained fairly steady to the end of the run.

A total of 52 northern pike (Esox lucius) were caught in the trap nets. Of these, 88.3% were 5 years old and younger. This high percentage of young fish likely represents strong recruitment of pike, rather than any increase in exploitation.

The 1981, 1982 and 1983 year classes were dominant, representing 19.2, 25.0 and 28.8% of the pike caught, respectively. Fish older than age 4 comprised 38.6% of the sample in 1986, as compared to 52% in 1985 and 24% in 1984 (Lockhart et al 1986). Thirty-three pike could be sexed externally; 19 were males and 14 were females for a male to female ratio of 1.4:1.

A small mesh gill net set upstream in the Falcon River on April 22 and April 29 produced a total of 6 walleye, 1 northern pike and 1 white sucker (Catostomus commersoni), indicating the continued use of the river as a spawning site.

Stomach analysis of brown bullhead (Ictalurus nebulosus) and yellow perch (Perca flavescens) caught in trap nets on the spawning grounds at Waugh revealed their continued predation on walleye eggs. The percentage of bullheads containing walleye eggs continued to drop, from 51% in 1985 to 23% in 1986 (Table 1). The number of eggs per bullhead sampled also dropped, from 132 eggs/bullhead in 1985 to 53 eggs/bullhead in 1986. This could reflect a decrease in the number of eggs being deposited on the grounds in 1986 due to cold weather and a reduction in numbers of female walleye present as compared to 1985. Spawning ground improvements carried out from 1983 - 1985 have provided protection for deposited eggs and reduced the vulnerability of eggs to predation. A similar trend in reduced egg predation was found for yellow perch (Table 1). White





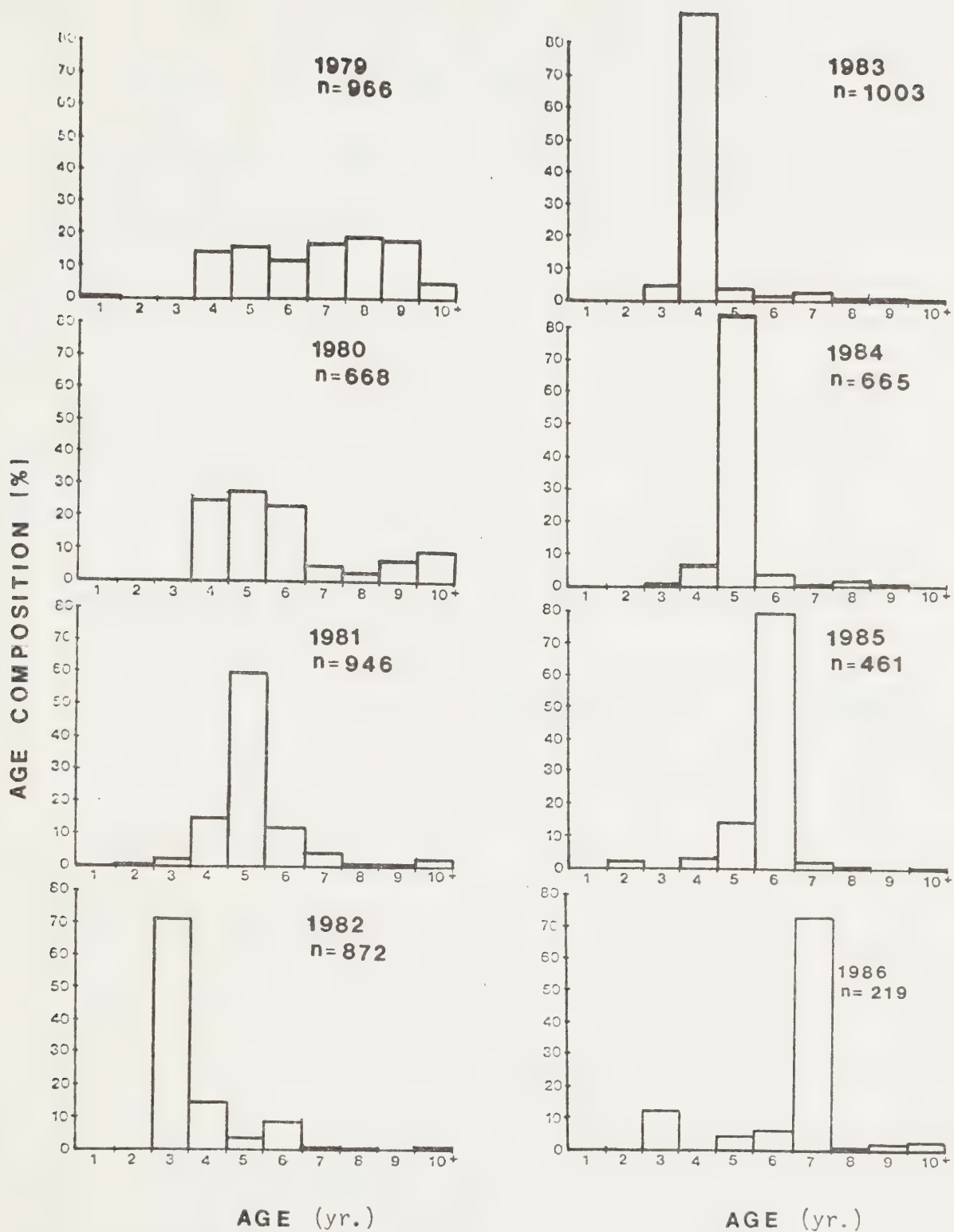


Fig. 2. Age composition (%) of WALLEYE caught in trap nets at the Waugh spawning site, Shoal Lake, during April and May, 1979 to 1986.





sucker eggs were found in only one of the bullhead sampled, while none were found in any of the perch. Eggs were not found in any stomachs of white sucker that were sampled.

A baited minnow trap was set near the trap nets from April 23, 1986, to May 9, 1986, in an attempt to catch small forage fish that might predate on spawn. A total of 96 yellow perch (total length range 7.7 - 13.7 cm) were caught; 50 were sampled. All were ripe males. Fifty-eight percent of the perch were found with walleye eggs at the rate of 19 eggs/perch sampled. Thirty-six percent of the perch had empty stomachs. No white sucker eggs were found in perch. This sample would indicate that substantial predation on walleye eggs by young yellow perch occurs, and should be taken into account when assessing possible sources of walleye recruitment failure.

Table 1. A comparison of stomach contents of brown bullhead and yellow perch caught in Waugh trap nets in 1984, 1985 and 1986.

	Bullhead			Perch		
	1984	1985	1986	1984	1985	1986
% with walleye eggs	60	51	23	57	44	19
No. of walleye eggs/fish with eggs	68	472	228	29	48	26
No. eggs/fish sampled	41	132	53	17	21	5
No. fish sampled	78	61	65	28	39	47

INDEX NETTING

Five standard index gill nets were set in May 1986 and ten standard gill nets were set each month from June to August 1986, at sites used in previous years (Lockhart et al 1986). These were composed of eight separate panels (15.2 x 1.8 m) ranging in mesh sizes from 3.8 cm to 12.7 cm (stretch mesh) in 1.3 cm increments. Attempts were made to sample and release any walleye



or pike found alive in the nets.

A mean catch-per-unit effort of 3.3 walleye/lift was obtained in 35 lifts. The 1979 and 1983 year classes accounted for 48.7% and 37.2% of the total walleye catch, respectively (Fig. 3). The 1982 and 1984 year classes were poorly represented, accounting for 1.8% of the total walleye catch. No walleye of the 1981 year class were caught. The 1980 year class appeared moderately strong, representing 8.0% of the total catch. No young-of-the-year (YOY) walleye were caught in index nets.

Mean lengths-at-age for walleye in 1986 were similar to those observed in 1985. The accelerated growth seen in past years appears to have levelled off (Fig.4).

Yellow perch formed the largest percentage (54.7%) of the total catch by number (Table 2). This was comparable to their representation in the 1985 catch of 58.1% (Lockhart et al 1986).

Table 2: Species composition expressed as percent composition by number, and catch-per-unit effort (C.U.E.) by number and by weight from index gill nets set in Shoal Lake, during May to September, 1986.

Species	Percent Composition	C.U.E. no./lift	C.U.E kg/lift
Lake whitefish	0.3	0.3	0.3
Cisco	21.7	16.4	1.6
Northern pike	6.3	4.8	9.6
White sucker	8.3	6.3	4.3
Burbot	0.3	0.2	0.3
Rock bass	2.7	2.1	0.3
Smallmouth bass	1.3	1.0	0.9
Yellow perch	54.7	41.4	2.7
Walleye	4.3	3.3	4.8
Trout-perch	0.1	0.1	0.1
All species	100.0	75.9	24.9





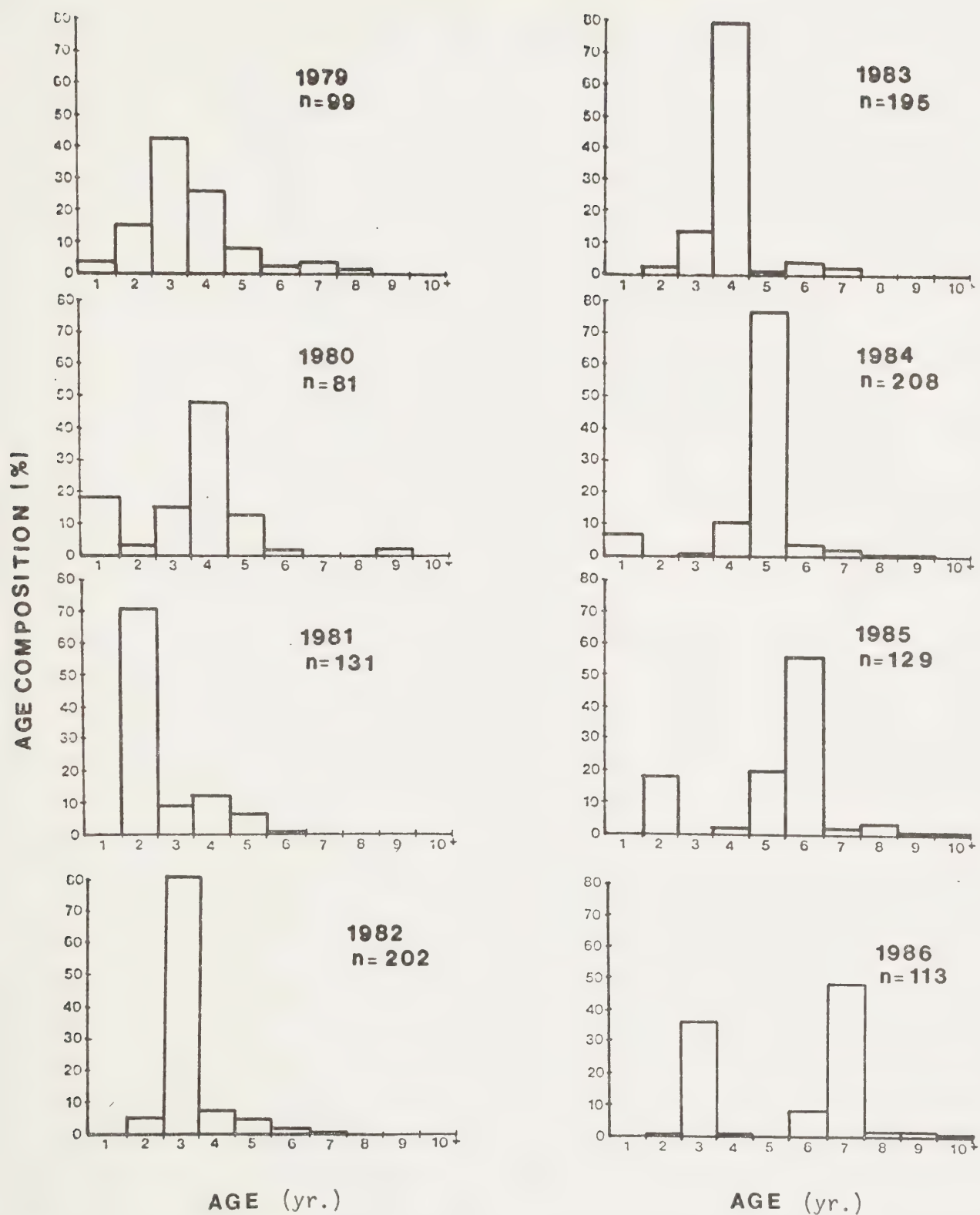


Fig. 3. Age composition (%) of WALLEYE caught in standard index gill nets in Shoal Lake, during May to September, 1979 to 1986.





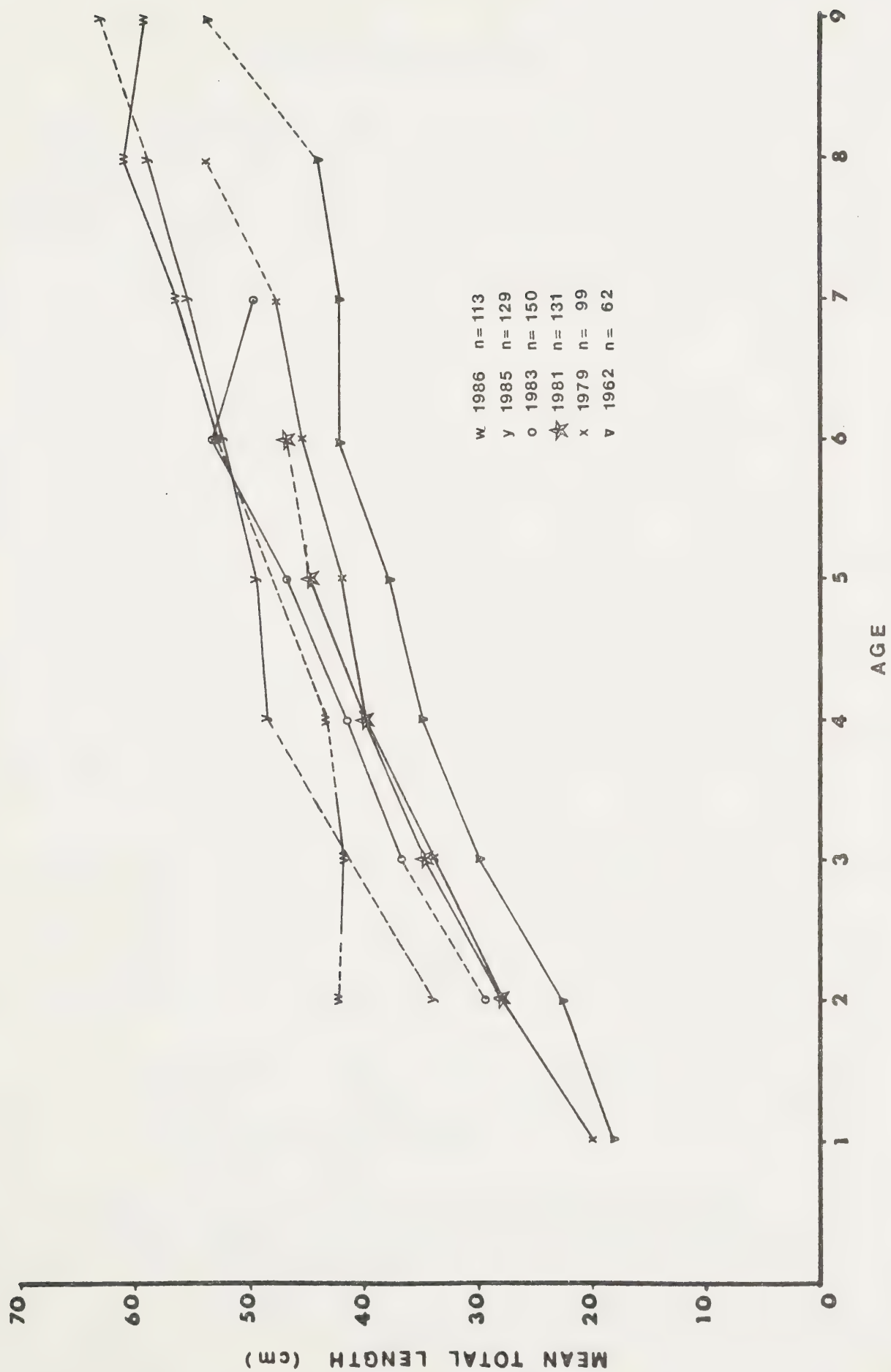


Fig. 4. Comparison of mean total lengths at age for WALLEYE caught in index gill nets during various years.



## SMALL FISH SAMPLING

Eleven index sites in July and ten index sites in August were seined with a 30.8 m bag seine. One experimental site in Snowshoe Bay was also seined in July and August. The Northwestern Region electrofishing boat was used during late July to sample areas poorly suited to seining. Two experimental gill net sets were made in September for YOY walleye using a standard index gill net.

A total of 21 seine hauls failed to produce any YOY walleye. The overall catch per-unit-effort for all small fish from index sites was 791 fish/seine, which represented a substantial decrease from the 1985 catch of 2,241 fish/seine (Table 3).

This decrease was due primarily to reduced numbers of YOY yellow perch in the total catch as compared to 1985. Spawning conditions were probably not as favourable for yellow perch as in 1985. Excluding yellow perch, the number of small fish caught per seine (140 fish/seine) was comparable to the 1985 catch of 191 fish/seine.

Electrofishing on Shoal Lake failed to produce any walleye during 1.75 hours of shocking time. Seven sampling runs were completed over a wide variety of potential habitat. Electrofishing is an effective method for the capture of small fish and should be continued in future programs.

No YOY walleye were caught in the 2 index gill nets set in September. Sampling in September/October should be continued to assess walleye year class strength.

An absence of YOY walleye in index nets, seines and electrofishing suggests the production of another weak year





Table 3. A comparison of seine net catches from Shoal Lake during 1983 to 1986, showing the total number of small fish and the percent of yellow perch caught.

Year	No. of seine hauls	<u>All species</u>		<u>All yellow perch</u>		<u>YOY yellow perch</u>		<u>Other species</u>	
		Total no.	No./seine	% total	No./seine	% total	No./seine	% total	No./seine
1983	21	15245	726	62	453	*	*	38	272
1984	22	27243	1238	69	852	26	317	31	386
1985	22	49293	2241	92	2050	89	1994	8	191
1986	21	16605	791	82	651	73	576	18	140

\* no distinction made between YOY perch and older perch



class in Shoal Lake.

## WALLEYE SPAWNING HABITAT ASSESSMENT

Potential walleye spawning sites were sampled with a fish egg collecting pan. Eggs were identified to species and judged to be alive or dead according to criteria used in previous surveys (Roos et al 1981).

Walleye eggs were found at all of the 9 sites sampled on Shoal Lake (Fig. 5). Surveys on April 22 and April 29, 1986 at Waugh showed the presence of walleye eggs along the entire length of the dyke (Fig. 1), with an average of 53 eggs per sample on the Falcon Bay side of the dyke and 180 eggs/sample on the Shoal Lake side of the dyke. Eggs on the Shoal Lake side were likely recently deposited, leading to large numbers in the sample. Surveys in previous years have shown the presence of low numbers of walleye eggs on the Shoal Lake side of the dyke (Val Macins, pers. comm.).

Seventy-six eggs/sample were collected at the improved spawning sites at the Falcon River bridge, while no walleye eggs were found along nearby unimproved areas. A sample taken at the mouth of the Winnipeg water intake at Waugh showed a large number of walleye eggs present, with an average of 333 eggs/sample. Survival of these eggs would be minimal as any fry would likely be swept into the intake. Very few white sucker eggs were found at any site sampled.

Egg baskets (Martin 1957) were placed at two sites along the dyke on April 22, 1986, and lifted from one week to one month later. Three egg baskets were buried south of trap net #1 (Fig. 1), and three were buried north of trap net #1 (Lockhart et al 1986). One tray from each site was lifted after 7 days. Approximately 84.5% of all walleye eggs present were alive, suggesting that they had recently been laid. One more tray









from each site was lifted after 16 days and a survival rate of 0.5% for walleye eggs was determined. Most eggs had likely hatched out by this time. The remaining two trays were lifted on May 20, 1986, after 28 days. No live walleye eggs were found at this time. Very few white sucker eggs were found in any of the trays along the dyke in 1986.

Fry traps (Corbett 1980) were placed in the canal leading from Falcon Bay into Shoal Lake (Fig. 1), in an attempt to catch emergent walleye fry. Approximately 60 yellow perch fry, but no walleye fry were caught. Use of fry traps should be continued in an attempt to assess the movement and survival of walleye fry from this major spawning location.

#### COMMERCIAL FISH

Commercial fish harvest from Shoal Lake in 1986 was minimal. A total of 618 kg of northern pike and 1062 kg of lake whitefish (Coregonus clupeaformis) were reportedly harvested. Several illegal gill nets were observed in Snowshoe Bay during May, 1986, and reported to enforcement personnel.

#### SPORT FISHERY

Angling for smallmouth bass (Micropterus dolomieu), northern pike and muskellunge (Esox masquinongy) continued to some degree in Shoal Lake. Anglers were primarily Manitoba cottagers and American guests at nearby resorts. Effort was concentrated in the Shoal Lake Narrows and Clytie Bay areas. A total of 13 parties were observed by survey crews throughout the summer. Twenty-five pike and 6 smallmouth bass were recorded in the creel. Enforcement personnel laid several charges for angling and possession of walleye in Shoal Lake.





## SUMMARY

The estimated size of the walleye spawning population at Waugh in 1986 dropped to 9,357 from 1985's estimate of 30,886. The 1979 year class continued to dominate, comprising 72.6% of all walleye sampled. The 1983 year class, represented by ripe males, appeared moderately strong. The spring of 1987 should see a greater number of males of this year class on the spawning grounds as sexual maturity is reached. The ratio of males to females was 0.49:1, reflecting the strong contribution of females from the 1979 year class in the spawning population. Weather conditions were not optimal for spawning.

A high percentage of pike aged 5 years and younger were caught on the spawning grounds. This would suggest increased recruitment of young pike rather than an increase in exploitation stress. The closure of the walleye fishery on Shoal Lake has led to reduced pressure on other species as well.

Stomach analysis of brown bullhead and yellow perch indicated their continued predation on walleye eggs. Spawning ground improvements of recent years should help provide greater protection for walleye eggs and increase survival during future spawning runs.

The 1979 walleye year class continued to dominate the overall walleye catch (48.7% of total) in index nets. The 1983 year class increased in importance, representing 37.2% of the total walleye catch. This year class may not be as strong as the 1979 year class but it may be vital in contributing mature fish to the spawning population.

No YOY walleye were caught in seining, electrofishing or index netting. Seining revealed that the 1986 year class of



yellow perch was not as strong as in 1985, further suggesting that the spring spawning period of 1986 was not as successful as in 1985.

Angling pressure continued to be minimal on Shoal Lake due to closure of the walleye fishery. Commercial harvest was also minimal, with most fishermen opting not to set trap nets for pike, whitefish or crappie.

Walleye stocks in Shoal Lake do not appear to be improving and may require assistance in the form of fall fingerling stocking in order to speed up the recovery. Any steps considered should be taken in the immediate future while several year classes of brood stock still remain in Shoal Lake.

#### ACKNOWLEDGEMENTS

Appreciation is expressed to the following people who assisted in making this report possible: Jim Rusak, Jon Stewart and Robin Clark for data collection and summary; Joan LeCain for data entry and typing of the report; Tom Mosindy and Val Macins for constructive criticism.



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(175 P.R. 87 04 01)  
ISBN 0-7729-2422-8